

Rhodora

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POLYEMBRYONY IN *SPIRANTHES CERNUA*.

R. G. LEAVITT.

IN the seed of *Spiranthes cernua*, I find that there is ordinarily more than one embryo. When this fact was first noticed, it was suspected that the occurrence might be local; inasmuch as, while the polyembryony is seen from a glance at the seeds or ovules at almost any stage, the case seems not heretofore to have been reported. Curtis (Bull. Torr. Bot. Club, vol. xx., p. 188) figured the seed, and he found but a single embryo. Material from a distance, however, kindly sent to me from Webster, Massachusetts, by Mr. L. J. Spalding, and from Toronto by Dr. Jeffrey, shows the same condition as the local material. Seed out of an herbarium specimen from Iowa is likewise polyembryonic.

Two spikes collected respectively in Melrose and in Beverly, Massachusetts, showed single embryos. One of these spikes was labelled "flowers yellowish." I have found a small plot of plants that have, also, a normal embryology. All these latter plants are vigorous specimens, and might perhaps be referred to the yellowish variety, if such a variety may be distinguished. Other plants characterized by long and dense spikes and yellow-tinged flowers have, however, displayed the polyembryonic trait.

The normal embryology — of which, with the abnormal, I hope soon to publish a fuller account — is interesting. The sexually derived embryo develops no suspensor at the micropylar end of the embryo-sac. It early establishes a connection with the opposite extremity, and from that quarter draws its nourishment. I may mention that I have readily found the pollen tubes applied to the embryo-sacs at the time of fertilization, and masses of empty tubes persisting in the

ovaries sectioned, even after the embryos are well along; this, in contrast to what I have noted in polyembryonic ovaries.

In the prevalent, abnormal development the inner integument of the ovules displays an extraordinary growth and tendency to form embryogenic masses even before the embryo-sac is mature. Indeed the sac seems ordinarily to be pushed aside by the adventive growths, and probably becomes functionless. I have rarely found traces of pollen tubes in the ovaries. In a test made to determine the ability of the plant to produce its polyembryonic seed under conditions absolutely excluding fertilization, I have, at the time of writing, got so far as to find adventive embryos of nearly the normal size. From present appearances I judge that the seed borne under test conditions will not differ from that ordinarily produced.¹

The adventive embryos number from one to five or six. When several occur together, some are sure to be smaller than others. Even when solitary, an adventive embryo is readily distinguished from an egg-derived embryo in lacking the slight apical protuberance which serves the normal germ as suspensor — or at least as haustorium. In my observation, adventive and normal embryos do not occur in the same pod, or even upon the same plant.

The embryonal tissue is apt to grow so vigorously as to distort and frequently to rupture the seed. It is common to find large, rounded, embryo-like masses outside the micropyle, connected by a chain of richly protoplasmic cells to the nourishing region at the end of the seed.

The forms of the embryos vary from spherical to elongate; not rarely irregular and lobed examples occur. The lack of uniformity in size, shape, and position of the embryos in the seed is in consonance with the irregularity in all respects characterizing this mode of reproduction.

THE AMES BOTANICAL LABORATORY, North Easton.

¹ Since the above was written the pods of the plant under observation have come to maturity with an abundance of seed full of embryos of the usual size and formation.

FERNS OF A DEEP RAVINE IN THETFORD, VERMONT.

A. LEROY ANDREWS.

A LOCALITY in the township of Thetford, Vermont, furnishes within a limited space such a variety of ferns, including several which are found very rarely, if at all, in the vicinity, that I am persuaded to attempt a brief description of it.

A deep, narrow ravine or gully cut in the side of a high hill, becomes in spring the bed of a small drainage brook, which later, however, becomes dry. Steep, rocky walls, clothed in a growth of forest, close out effectually the rays of the sun, producing that indescribable effect of forest twilight which we associate with the growth of certain species of ferns. In every available place is collected a thick deposit of vegetable mould. Here the ferns revel in a luxuriance that, in spite of a remarkably dry season, is hardly short of tropical. They fringe the overhanging rocks, adorn every fissure, grow in immense feathery clumps of graceful fronds at the bases of the cliffs and along the brook-bed—a garden of ferns such as one seldom sees.

But the interest is not wholly on the side of the æsthetic,—the botanist also comes away well rewarded. A canister of specimens furnishes the means for an interesting comparison and study.

The species with their distribution are as follows: From the rocky pastures above straggle down large beds of *Dicksonia pilosiuscula*, in varying shades of light and dark green. The other species, uniformly distributed on the steep slopes, are *Aspidium marginale*, *A. acrostichoides*, *Pteris aquilina*, *Phegopteris Dryopteris*, *P. polypodioides*, with occasional sterile fronds of *Onoclea sensibilis*. Upon the flat tops of rocks grow little colonies of *Polypodium vulgare*, while delicate bunches of *Cystopteris fragilis* (apparently the season's second growth) cluster beneath them, rarely showing fertile fronds. In the accumulation of damp mould along the brook-bed grow the species deserving especial mention. Mixed in charming contrast of form and tint are large clumps of *Aspidium marginale*, *A. spinulosum*, var. *intermedium*, *A. Goldianum*, *A. aculeatum*, var. *Braunii*, *Adiantum pedatum*, *Asplenium thelypteroides*, *A. angustifolium*, with specimens of *Botrychium Virginianum*, while the outlet of the ravine is marked by a thicket of tall fronds of *Onoclea Struthiopteris*.

The three species, *Aspidium Goldianum*, *A. aculeatum*, var.

Braunii and *Asplenium angustifolium* were hardly to be expected here, and careful search has failed to reveal them elsewhere in the vicinity. All are species of the deep woods of mountainous regions, the station for *Asplenium angustifolium* being close upon the eastern limit of its range in New England, and that of *Aspidium aculeatum*, var. *Braunii* one of comparatively few in New England, the others being mostly confined to the White and Green mountains, or to more northern mountainous localities. Thetford, situated on the Connecticut River, is not at all mountainous, possessing only a few hills with isolated patches of woods. The ferns of the ravine, which I have described, represent then, apparently, the few survivors of a primitive, uniformly wooded condition, and will themselves undoubtedly soon succumb to the already threatened deforestation of their home.

Since writing the above, further observation reveals a single plant of *Aspidium acrostichoides*, var. *incisum*. The plant is noticeably distinct, with thicker, very dark green fronds, large, deeply-incised pinnae, and the fruiting dots occurring in small numbers on each pinna, separate, and in no case confluent or covering the pinna. President Brainerd of Middlebury kindly confirmed my identification.

THETFORD, VERMONT.

TWO NORTHEASTERN THALICTRUMS.

M. L. FERNALD.

(Plate 21.)

LATE in June, 1899, the Josselyn Botanical Society of Maine spent a forenoon exploring the south bank of the Aroostook river at Fort Fairfield, Maine. Among the more striking discoveries was a delicate meadow-rue first detected by Miss E. L. Shaw in the alluvial thicket below the village, and afterwards found in abundance, by other members of the party, in the thicket which, along the Aroostook (as well as the St. John), forms the boundary between the steep wooded bank and the gravelly beach of the river. The *Thalictrum*, then in bloom, was a dioecious or slightly polygamo-dioecious species, suggesting in its flowers, and its thin glaucous foliage, the early meadow-rue (*T. dioicum*) of southern New England. The stems of the Aroostook valley plant, however, were much taller, often 1 m. high, bearing from three

to five large leaves and some smaller ones in the inflorescence. The rootstock of the plant, furthermore, was slender and elongated, very unlike the short thickish caudex of *T. dioicum*; and while the flowering season of this northern plant was just beginning, the fruit of *T. dioicum* in southern Maine and Massachusetts was already past maturity. The plant was obviously distinct from the recognized New England species; and it was pronounced by Professor John Macoun, who was in the party, unlike any species known to him in eastern Canada. The immature condition of the material, however, rendered a final determination of the species impossible.

During the following September an unsuccessful attempt was made by the writer to secure fruit from the Fort Fairfield plants. Somewhat earlier in September, 1900, a visit was made to the St. John valley, where plants very similar in appearance to the Fort Fairfield species were seen in abundance in the thicket between the river-beach and the high wooded banks. These plants on the St. John were invariably past fruiting, as they were likewise at the original station at Fort Fairfield. About two miles from Miss Shaw's station for the plant, however, a single specimen, scarcely 4 dm. in height, was found in fine fruit. Severe early frosts had injured the plant for herbarium purposes so that after the fruit had been gathered the stem and leaves were inadvertently tossed into the river. On second thought, however, the rootstock was carefully dug and examined, when it proved to be not elongated and slender as in the plant for which it had been mistaken, but short and thickened, much as in *T. dioicum*. Upon returning to the Gray Herbarium it was found that the achenes of this plant were unlike those of any described species of the genus, and that the smaller plant of the Aroostook valley must be a second species unrecognized in our New England flora.

In Macoun's Catalogue of Canadian plants, and in Fowler's Catalogue of the plants of New Brunswick, numerous stations for *Thalictrum dioicum* in the St. John valley are cited, and the plant is also reported from "flat lands" on the Restigouche, while *T. purpurascens* is reported from numerous stations in Nova Scotia and from Anticosti. An examination of the material in the herbaria of the Canadian Geological Survey Department and of the Natural History Society of New Brunswick, kindly placed at the disposal of the writer by Professor John Macoun and by Mr. Geo. U. Hay, shows that these plants are in the main identical with the larger species recently discovered on the Aroos-

took. In these herbaria the tall plant, found in flower at Fort Fairfield by Miss Shaw, is well represented by fruiting material which proves it beyond a doubt to be *T. occidentale*, Gray, a species characteristic of the mountains of British Columbia, Washington and Oregon, rarely found eastward to the Rockies. So far as the herbarium material shows, the Nova Scotia and the Anticosti plants are both good *T. polygamum*, rather than *T. purpurascens* with which they have been placed. A fruiting specimen from the mouth of the Restigouche, reported in the first part of Macoun's Catalogue as *T. dioicum*, has subsequently been treated by Professor Trelease as a probable hybrid between that species and *T. purpurascens*. But that this disposition of the plant is far from satisfactory may be seen from the fact that the Restigouche specimen comes from a region 230 miles northeast of the nearest authenticated station of *T. dioicum*,¹ and some 450 miles from the northeastern known limit of *T. purpurascens*. The plant is, however, identical with the larger species of the St. John and Aroostook valleys and it matches perfectly *T. occidentale* of the Northwest.

The smaller *Thalictrum*, of which fruit was obtained at Fort Fairfield during the past September, is beautifully represented in the herbarium of the Geological Survey Department of Canada by a sheet of flowering specimens collected by Professor Macoun in thickets at Ottawa in August, 1894. In habit this plant strongly suggests small-leaved forms of the Rocky Mountain *T. Fendleri*, but that species has elongated rootstocks and strongly compressed achenes; while in the northeastern plant the caudex is short, and the short, plump achenes terete. This plant, as already stated, can be referred to no species of America nor of the Old World, and it is here proposed as

THALICTRUM confine. Rootstock 2 to 4 cm. long, bearing 10 to 12 strong roots: stem slender, 3 to 6 dm. high, puberulent, pale green, often finely mottled with purple, leafy to the summit: the four or five leaves glandular-pruinose, glaucous beneath, the lower including the long petiole 1.5 to 2 dm. long, the uppermost including the short petiole 3 or 4 cm. long; leaflets suborbicular broadly obovate or flabellate, coarsely toothed, 0.75 to 1 cm. long, the terminal on slender petiolules, the lateral short-

¹ K. C. Davis (Minn. Bot. Studies, Ser. 2, 515) credits this species to Labrador, but the occurrence of the plant in that district is seriously doubted. The only Labrador specimen so named in the herbarium of the Geological Survey Department of Canada is clearly *T. polygamum*.

petiolulate or subsessile: flowers dioecious, greenish or purplish, the panicles 1 or 2 dm. high, with ascending branches: sepals greenish, oblong-lanceolate, caducous: carpels 6 to 10, glandular-pruinose; stigmatose style lance-subulate, 3 to 5 mm. long; achenes ovate-lanceolate, excluding the persistent style, 4 or 5 mm. long, 2 or 3 mm. thick, plump, subterete, scarcely compressed or ancipital, with 8 simple or slightly branched strong ribs, the alternate ones strongest; seed linear-lanceolate, hardly filling the cell.—Alluvial thickets, ONTARIO, Rideau Hall, Ottawa, in flower, August 8, 1894 (*John Macoun* in herb. Geol. Surv. Dept. Canada, no. 2,956): MAINE, by the Aroostook river, Fort Fairfield, in fruit, September 19, 1900 (*M. L. Fernald*).

The characters and eastern stations of the larger plant may be summarized as follows:

T. OCCIDENTALE, Gray. Rootstock slender, elongated: stem glabrous, 1 m. or less high, leafy to the summit, the three to six leaves glaucous beneath, smooth or minutely glandular, the lower including the long petiole 1 to 2.5 dm. long, the uppermost including the short petiole 0.5 to 1 dm. long, those of the inflorescence often simple; leaflets thin, reniform or obovate, with coarse rounded lobes, the terminal on slender petiolules, the others short-petiolulate or subsessile: flowers dioecious or polygamo-dioecious, greenish or purplish, the panicles 1.5 to 3 dm. high, with ascending branches: sepals oblong: carpels glabrous or minutely glandular-pruinose; achene excluding the persistent style 6 or 7 mm. long, 2 or 3 mm. wide, compressed, strongly ancipital, with three strong somewhat branching ribs on each side: filaments, yellowish greenish or purplish, elongated, slightly clavellate; anthers linear, mucronate.—Proc. Am. Acad. VIII. 372. *T. dioicum* × *purpurascens*, Trelease in J. M. Macoun, Can. Rec. Sci., 1894, 77.—NEW BRUNSWICK, woods ("flat-lands," Fowler's Catalogue), Eel River, Restigouche Co., in fruit, July 29, 1876 (*R. Chalmers* in herb. Geol. Surv. Dept. Can. no. 844); South Tobique Lakes, July 18, 1900 (*G. U. Hay*); along the St. John river above Woodstock, in flower and young fruit, July 3, 1899 (*John Macoun* in herb. Geol. Surv. Dept. Can. no. 21,136); St. John, in fruit, Aug., 1890 (*G. U. Hay*): MAINE, thickets by the Aroostook river, Fort Fairfield, in flower, June 29, 1899 (*Miss E. L. Shaw* and others of the Josselyn Botanical Society of Maine); MANITOBA, Lake Winnipeg valley, 1857 — previously referred to *T. dioicum* (*Bourgeau*): Montana, Wyoming and westward.

GRAY HERBARIUM.

EXPLANATION OF PLATE 21. — *Thalictrum confine*, drawn by C. E. Faxon from original material. Figs. 1 and 2, fertile plant from Ottawa; fig. 3, flower of the same; fig. 4, achene from Fort Fairfield specimen.

THE FIG AS A HARDY PLANT IN NEW ENGLAND. — For some years the edible fig, *Ficus carica*, L., has maintained itself in Providence, Rhode Island, in a suffrutescent state. With its roots deeply buried in the cellar walls of a ruined house, it every year comes up, very late, but thrives vigorously. Finally, it is caught by the autumnal frosts, and all parts above ground perish. I have repeatedly thought I had seen the last of the plant, when suddenly it would again throw up its shoots.

In August of this year, I found *Ficus carica*, L., growing under very similar conditions in a waste lot in Gloucester, Mass. I do not know if it maintains itself through the winter.

W. WHITMAN BAILEY, Brown University.

SOME OBSERVATIONS UPON THE EARLY GROWTH OF IMPATIENS BIFLORA.

C. B. GRAVES.

It may not be generally known that the common jewel-weed, *Impatiens biflora* Walt. (*I. fulva* Nutt.), at one stage of its growth is an opposite-leaved plant. At any rate there is no mention of this feature in such descriptions of the genus as are accessible to me. That such is the fact, however, is easily seen by examining a patch of young plants in the spring. Following the cotyledons come either three or four pairs of strictly opposite leaves at well-marked nodes. These nodes persist throughout the season, becoming, in fact, much more prominent later, and frequently have opposite branches arising from them. In this young stage the alternate arrangement is to be found only beginning among the very small leaves crowded at the summit. At this time the most conspicuous feature is the distant pairs of long-petioled opposite leaves, and this, with the slender unbranched stem and small size (6 to 15 inches tall in cool woods on May 30 of this year), gives the plants an appearance strikingly unlike that of the late summer specimens.

Another point of interest is the early appearance of cleistogamous flowers. Already, by May 30, in the woods visited on that date, they were uniformly present and young capsules were easily found. By the middle of June — probably earlier — pods were ripe and discharging seeds. They continue to be abundantly produced for at

least a month before petaliferous flowers appear. This past season it was not until July 15 that the first flowers were seen here, and for a week or more after that they occurred only sparingly.

Plants in cool, moist woods may retain their opposite leaves until late July, and very many of them apparently die without ever showing a petaliferous flower. During the remainder of the season, both kinds of flowers are freely produced.

Impatiens in this respect offers a noteworthy contrast with Viola, whose petaliferous flowers always precede and sometimes follow the cleistogenes of summer. From this behavior of Impatiens it seems hardly probable that temperature can be the only factor determining the production of one or the other form of flower, as has been suggested in the case of the violets.

THE NOMENCLATURE OF THE NEW ENGLAND AGRIMONIES.

B. L. ROBINSON.

FOUR years ago Mr. E. P. Bicknell¹ published an account of the American species of *Agrimonia*, lucidly distinguishing no less than seven of them, instead of the two commonly recognized in the then current manuals. While Mr. Bicknell's work bears ample evidence of care and accuracy in the botanical observations which he recorded, it fails signally to carry conviction in the matter of synonymy and nomenclature. The following notes, it is hoped, may contribute to a final settlement of our five New England species of this genus.

I A. HIRSUTA, Bicknell, Bull. Torr. Club, xxiii. 509 (1896). There can be no doubt from Wallroth's careful and detailed characterization that this is his *A. gryposepala*, published in 1842. To displace this well-described specific combination of Wallroth, Mr. Bicknell takes up the varietal name "hirsuta," published by Muhlenberg in his catalogue. Unfortunately, however, Muhlenberg's plant was not properly described, and *A. Eupatoria hirsuta*, Muhl., is at best a *nomen subnudum*. Now, whatever difference of opinion may exist on the question whether a specific name may be displaced by an earlier varietal name, there can, I think, be only one opinion as to the inadvisability of discarding a name of known and definite application and

¹ Bull. Torr. Club, xxiii. 508-523, t. 282-283.

replacing it by one so vague and obscure, that its original application is a matter of mere conjecture.

Let us see upon just what grounds Mr. Bicknell can maintain the identity of *Agrimonia Eupatoria hirsuta*, Muhl., with the species to which he has applied the name *A. hirsuta* (Muhl.) Bicknell. The type of Muhlenberg's plant is, I learn, either not in existence or at least in a state of confusion with other material, which makes its certain identification impossible. Consequently our sole knowledge of *A. Eupatoria hirsuta*, Muhl., is to be derived from the original description. Muhlenberg's treatment of *Agrimonia* is as follows :

<i>Calix.</i>	<i>Corolla.</i>	DIGYNIA	<i>Habitat, etc.</i>
5 fid.	5 pet.	360 AGRIMONIA. AGRIMONY.	Semina 1-2 in calice.
	lut.	1. eupatoria hirsuta 7/8 rough-haired.	Pens. fl. Aug. Car.
	lut.	B. glabra 7/8 smooth	Pens. fl. Aug.
	lut.	2. parviflora 7/8 dotted	Pens. fl. Aug.
	lut.	3. pumila 7/8 little	Miss.

A glance at this treatment will show that the description of *A. Eupatoria hirsuta* contains but one distinctive word, "rough-haired."¹ It must have required extraordinary powers of intuition to discover from this one word just which of seven more or less hairy plants Muhlenberg meant by his *Agrimonia Eupatoria hirsuta*, especially as the plant in question, according to Mr. Bicknell's interpretation, turns out to be villous rather than hirsute and is one of the least hairy species of the whole group,—much less so, in fact, than the typical *A. Eupatoria* of Europe. Unfortunately many of us are not endowed with this well-nigh necromantic power, and must accordingly stop in our retrogressive search after priority at the earliest sufficient and intelligible description. To persons of these more modest attainments *A. Eupatoria hirsuta* must be a negligible *nomen subnudum* and *A. gryposepala*, Wallr., be preferred to *A. hirsuta* (Muhl.) Bicknell.

It is true the combination *A. Eupatoria* β *hirsuta* was also employed by Dr. Torrey and, as Mr. Bicknell informs us, "independently for a more hairy form of the same plant." I have not succeeded in finding the type of this variety in the Torrey herbarium. Concerning the variety we learn from Dr. Torrey's description merely that it was a smaller and much more hairy plant than what Torrey regarded the typical form of *A. Eupatoria*, the latter being probably the very plant

¹ The range including Carolina cannot be regarded as distinctive, since several species are either known to occur in Carolina or from their general distribution are to be expected there.

(*A. gryposepala*) to which Mr. Bicknell has applied the name *hirsuta*. Torrey's *A. Eupatoria* β *hirsuta* has therefore scarcely more definiteness than *A. Eupatoria hirsuta*, Muhl.

2. *A. BRITTONIANA*, Bicknell, l.c. 510. Suspecting from an examination of authentic material of Mr. Bicknell's new species that it was identical with the plant of Central Europe which has for many years figured as *A. pilosa*, Ledeb., I forwarded some specimens of the American plant to Berlin, where it was subjected at the Royal Botanical Museum to a critical comparison by Mr. J. M. Greenman, who pronounces it in all respects identical with the material there representing Ledebour's species. I have not had an opportunity to have the plant compared with Ledebour's type, but have no reason to doubt the accuracy of the German specimens, especially as Russian specimens of *A. pilosa*, determined by no less an authority than Maximowicz, are clearly the same. Mr. Bicknell says of his species. "*A. Brittoniana* is in fact very distinctive from any American species while nearly related to certain Asiatic forms — *A. viscidula* Bge., *A. pilosa* Ledeb., and *A. Dahurica* Willd., plants which have been variously confused together by authors, and all of which have finally been referred to *A. Eupatoria* L." This is certainly a high-handed way of disposing of a species like *A. pilosa*, which is not only well represented in the larger herbaria, but recognized in such standard works as Nyman's *Conspectus*, several editions of Garcke's *Deutschlands Flora*, Thomé's *Flora von Deutschland*, etc. It is also rather inconsistent with other parts of Mr. Bicknell's work. Surely various names for the American Agrimonies have been much confused, and most of them were referred to *A. Eupatoria*, yet Mr. Bicknell has not hesitated to take them up even when their status, as in *A. Eupatoria hirsuta*, is most vague.

However, there is still an earlier name for Mr. Bicknell's *A. Brittoniana*, as this is just what Michaux described as *A. striata*, a fact suggested to me by Michaux' rather characteristic description, and recently confirmed by a personal examination of the well-preserved type of *A. striata* at the Jardin des Plantes in Paris. The Michaux specimen is in every way a close match for Mr. Fernald's plant from St. Francis, Maine, the latter being Mr. Bicknell's first-mentioned type of *A. Brittoniana*. As a corollary of these observations, attention may be called to the identity of *A. pilosa*, Ledeb., as now interpreted in Germany and Russia, with *A. striata*, Michx., which, as the earlier

name, should be accepted for this species in Europe as well as in America.

3. *A. MOLLIS*, Britton, Bull. Torr. Club. xix. 221 (1892); *A. Eupatoria* γ *mollis*, Torr. & Gray, Fl. i. 431 (1840). The earliest specific combination for this plant is *A. platycarpa*, Wallr., Beitr. i. 38 (1842), a name which will be preferred by conservative botanists to the recent combination derived by Professor Britton, from the earlier varietal name *mollis*.

4. *A. STRIATA*, Bicknell, l. c. 509, not Michx. A significant fact regarding Mr. Bicknell's interpretation of the Michauxian *A. striata* is that its range — "Southeastern New York, and doubtless Connecticut, to Virginia, west to Missouri" — did not include Michaux' type station which was in Canada (presumably Quebec). Had Mr. Bicknell noticed this fact he could scarcely have failed to surmise the identity between Michaux' plant and Mr. Fernald's St. Francis plant from the same general region. The earliest satisfactory name for *A. striata*, Bicknell not Michx., is *A. microcarpa*, Wallr.

5. *A. PARVIFLORA*, Solander. This is the only one of the five species which Mr. Bicknell credits to New England, which appears to me to bear a correct name in his revision.

In conclusion, our New England forms may be synopsized thus :

Roots fibrous, unthickened,

Principal leaflets numerous, 9 to 15. *A. PARVIFLORA*, Solander.

Principal leaflets fewer, 3 to 7 (rarely 9).

Bristles of the fruit early spreading.

A. GRYPOSEPALA, Wallr. (*A. hirsuta*, Bicknell).

Bristles of the fruit erect, connivent.

A. STRIATA, Michx. (*A. Brittoniana*, Bicknell).

Roots fusiform, distinctly thickened,

Leaflets smoothish *A. MICROCARPA*, Wallr. (*A. striata*, Bicknell).

Leaflets tomentose beneath. *A. PLATYCARPA*, Wallr. (*A. mollis*, Britton).

A. gryposepala, Wallr., and *A. striata*, Michx., are rather widely distributed in New England, but *A. parviflora*, *A. microcarpa*, and *A. platycarpa* appear to reach their northeastern limit in Connecticut, and have not, to the knowledge of the writer, been reported from any other New England state.

GRAY HERBARIUM.

THE REPRESENTATIVES OF *SCIRPUS MARITIMUS* IN AMERICA.

M. L. FERNALD.

THE bulrush, so abundant in all New England saltmarshes, and characterized by its densely clustered thick brown spikelets and its long moniliform rootstocks with subspherical tubers, has been generally known as *Scirpus maritimus*, L. The species, as it grows upon our eastern coast, presents two marked forms. One, the abundant plant of the New England marshes, has ovate, ovate-oblong or oblong spikelets densely clustered in a head subtended by two or three involucreal leaves. The other, sometimes growing with the dense-headed form and often intergrading with it, is characterized by the somewhat branched inflorescence, elongated rays springing from near the base of the dense central head of spikelets. This form with the branching inflorescence is much less common in New England than is the plant with congested inflorescence, but further south it is common, and it occurs also inland and upon the Pacific coast, as does likewise the plant with dense heads. The two forms of the plant are thus of very broad range in America, but, aside from their habital differences, no characters are found by which they can be separated. In their extremes they are strikingly different, but, with very numerous transitional forms and no perceptible differences in the spikelets and achenes, the two plants can be considered only varieties of one broadly distributed species.

In 1803 Michaux described this American plant, or at least the more branching form, as *Scirpus maritimus*, var. *macrostachyus* ("spicis sessilibus pedunculatisque"), distinguishing it from the European *S. maritimus* by its thicker spikelets ("Spiculæ quam in europaea multo crassiores"). In 1814 Pursh described as a species, *S. robustus*, the large plant ("spicis oblongis, corymbo composito") with the note, "certainly specifically distinct from *S. maritimus*, with which I carefully compared it," and in this species he included the var. *macrostachyus* of Michaux.

Subsequent authors, however, treated the American plant as identical with the European *S. maritimus*, and under that name it was known in America until 1892, when Dr. Britton pointed out that the plant of the eastern saltmarshes differed from *S. maritimus* not only in its thicker spikes but in its achenes, those of the European species

being trigonous, while those of the American *S. robustus* are compressed or lenticular. The achenial character seems a constant one in the American plants examined; and this, together with the thicker spike already emphasized by Michaux and Pursh who must have been familiar with the true *S. maritimus* of Europe, sufficiently distinguishes *S. robustus* of Pursh from the Linnean species with which it has been confused. Some specimens from our Pacific coast are doubtfully referred by Dr. Britton to the true *S. maritimus*, but no mature achenes have been examined, and for the present the status of that species in our flora must remain doubtful.

In the Illustrated Flora Dr. Britton describes as *S. robustus* the plant with spikelets "in a dense, often compound, terminal cluster." This, as already stated, is the commoner form of the plant on our northeastern coast, but the form obviously intended in the descriptions of both Michaux and Pursh is the one with definitely branching inflorescence. In the same work Dr. Britton describes as a species, *S. campestris*, a rather characteristic plant of the Great Plains and Rocky Mountains, with exceedingly light-colored spikelets. Except for the rather inconstant color character, this Great Plain plant does not differ, however, from the dense-headed plant of the coastal region.

In 1899 Professor Aven Nelson published as a species, *Scirpus paludosus*, a Wyoming plant similar to *S. campestris*, Britton, "from which it is clearly separated by its remarkable tubers (subspherical, 10-25 mm. in diameter)," as well as by its darker scales and achenes. Comparison with specimens from Professor Nelson shows that his species is in no way different from the common American plant with brown spikelets in dense terminal heads. Furthermore, *S. paludosus* instead of differing from *S. campestris* in its "remarkable tubers" is very like that plant (as shown by herbarium specimens) in this point—a character likewise shared by the European *S. maritimus* as well as our own *S. robustus*.

In his description of *Scirpus campestris*, Dr. Britton emphasized the pale color of the achenes, but an examination of mature achenes shows them often to be quite as dark as in *S. paludosus* and the larger *S. robustus*. With only the pale color of its spikelets to distinguish it from the common dense-headed form of *S. robustus*, *S. campestris* seems much better treated as a Great Plain variety of that species. The identity of Nelson's *S. paludosus* and the common form with congested

spikelets has already been noted ; and that the latter plant, as seen on the eastern coast, is only an extreme form of *S. robustus* is well known to students of our saltmarsh vegetation. We have, then, in America three strong tendencies in *S. robustus*, which may be summarized as follows :

SCIRPUS ROBUSTUS, Pursh. Spikelets brown or ferrugineous, oval to oblong, 1.5 to 3 cm. long, 7 to 12 mm. thick, clustered in a subglobose terminal head, and with several elongated rays bearing one to several spikelets ; all much exceeded by the 2 or 3 involucre leaves ; achenes from obovate to suborbicular, compressed or lenticular, not angled on the back. — Fl. i. 56 ; Britton, Trans. N. Y. Acad. Sci. xi. 80, at least as to synonyms. *S. maritimus*, var. *macrostachyus*, Michx. Fl. Bor.-Am. i. 32 ; Gray, Man. 527. *S. maritimus*, in part, of American authors, not L. — Saltmarshes of the coast, New England to Texas and in alkaline regions of the interior (NEW YORK at Salina, *Clinton* ; NEW MEXICO, *C. Wright*, no. 1962, in part, etc.), also on the Pacific coast from WASHINGTON (*Piper*, no. 1008) to CALIFORNIA (*C. Wright*, etc.).

Var. **paludosus**. Spikelets brown or ferrugineous, in a dense, rarely compound, head, usually without elongated rays. — *S. paludosus*, Aven Nelson, Bull. Torr. Bot. Cl. xxvi. 5. *S. maritimus*, in part, of American authors, not L. *S. robustus*, Britton in Britton & Brown, Ill. Fl. i. 268, as to descr. and fig. Saltmarshes, abundant on the Atlantic coast from the Gulf of St. Lawrence (?) and New England southward, in the interior at various alkaline stations (Salina, NEW YORK, *Clinton* ; SASKATCHEWAN, *Bourgeau* ; Cypress Hills, *Macoun* ; western DAKOTA, *Leiberg* ; Reno Co., KANSAS, *Hitchcock* ; Howell Lakes and Seven Mile Lakes, WYOMING, *A. Nelson*, nos. 5312, 6878 ; Santa Inez Mountains, CALIFORNIA, *Mrs. Cooper*, etc.), and on the Pacific coast (CALIFORNIA, *Hartweg*, etc.).

Var. **campestris**. Similar to the latter, but spikelets straw colored or very pale. — *S. campestris*, Britton in Britton & Brown, Ill. Fl. i. 267. "Manitoba" to Kansas, Nevada, eastern California, and northern Mexico — (Western KANSAS, *Oyster* ; NEVADA, Humboldt Sink, *Watson*, no. 1214 ; ARIZONA, Gila, *Thurber*, no. 687 ; NEW MEXICO, Rio Laguna, *Marcy Exped.* ; CALIFORNIA, Mojave Desert, *Cooper*, no. 2216, *Parish*, no. 1544 ; SONORA, Horseshoe Bend, 1889, *Palmer*, no. 931).

GRAY HERBARIUM.

YELLOW-FRUITED *ILEX VERTICILLATA*.—In a recent excursion into the country to collect and compare the different forms of *Carya* and *Quercus*, to notice the effects of frost on the foliage, and incidentally to visit the new pumping station for the water supply of the city of New Bedford, located in Lakeville, fourteen miles from the city, I had the good fortune to find something novel and interesting.

On leaving the electric car at Lakeville, I walked down a new road, recently opened through the woods, to the beautiful lake known as Little Quittacus, distant half a mile from the main road. After proceeding about half the way, I espied by the roadside a clump of bushes bearing a bright yellow berry, so unlike any other fruit as to arrest the attention at once. Although but a few scattered leaves remained upon the bushes, they were easily identified as a form of *Ilex verticillata*, Gray, being, in fact, the forma *chrysocarpa*, Robinson, RHODORA, 2, 106, of which the only previously recorded station is Georgetown, Massachusetts.

In the immediate vicinity there were many bushes bearing the normal scarlet berries, but a thorough search for other specimens of this rare variety was without avail. Passers by had evidently had their curiosity awakened, for a large branch of the golden berries was thrown carelessly by the roadside. This yellow-fruited form of our common black alder is, I find, in cultivation at the Arnold Arboretum, and there, as in its wild state, exhibits an earlier defoliation than neighboring specimens of the typical red-fruited variety.—E. WILLIAMS HERVEY, New Bedford, Massachusetts.

POLYGALA POLYGAMA, VAR. ABORTIVA MERELY AN AUTUMNAL STATE.—It is a well-known fact that *Polygala polygama*, Walt., bears normally two kinds of flowers, namely, the conspicuous ones with well-developed corolla, and the small pale or greenish cleistogamous flowers. The former are borne in terminal racemes, while the latter are usually confined to short basal shoots which often push themselves under the leaf-mould or surface soil. In his detailed monograph of the genus *Polygala*,¹ however, Professor Chodat described as var. *abortiva*, a supposed form of *P. polygama* in which short racemes of cleistogamous flowers arose also from the upper axils, even the terminal raceme sometimes bearing only reduced

¹ Mém. Soc. Phys. Hist. Nat. Genève. xxxi. pt. 2. no. 3, 280.

and cleistogamous flowers. This form has been observed at various points in New England, and always at places where the typical form is also known to occur. As it presented no difference of foliage, its status as a variety has been subject to suspicion. Some months ago Mrs. H. A. Penniman of South Braintree, Massachusetts, having detected its peculiar character, sent specimens of the variety *abortiva* to the Gray Herbarium. On learning of its doubtful status, she undertook a careful observation of the variety and species as they occurred about her summer home at Brewster, Massachusetts. She has now found that individuals, which during the spring and summer exhibit the character of the typical form, frequently, if not normally, develop, in early autumn, the cleistogamous racemes from their upper axils and become transformed into the so-called var. *abortiva*. This is accordingly shown to be merely a late state of the typical plant, fully analagous, in fact, to the autumnal cleistogamous state of our common violets. Mrs. Penniman's observations are substantiated by an excellent suite of specimens deposited in the Gray Herbarium. — B. L. ROBINSON.

TRICHOLOMA PORTENTOSUM.

H. WEBSTER.

AMONG the species of *Tricholoma* which have come into favor with the mycophagists of eastern Massachusetts is *Tricholoma portentosum* Fries, an edible toadstool which is usually abundant in late autumn, when, as was the case this year, October and half of November pass without the coming of severe frost. Practically confined to pine woods, or at least to woods of coniferous trees, it there appears in such quantities as in many places to alter the look of the needle-strewn ground. At intervals of a few yards the pine needles are pushed up from below in loose heaps, beneath which clumps of the gray-topped mushrooms stand in a measure protected from the frost; or the caps are raised quite through the needles and the thick white or yellowish white stems stand out against the brown background. As the caps are sticky at first, they carry up with them some of the pine needles, which remain firmly attached even after the surface has become quite dry. In woods where the carpet of needles is soft and thick, however, the fungus does not so plainly betray its presence, ex-

cept to the squirrels. They know it, and probably are on the watch for it, for it is one of their regular autumn foods, which they can use while storing away their winter supply of nuts. But for these foragers, who scratch away the pine needles and drag the mushrooms to a convenient mound, where they leave the remnants of their feast scattered about, or who tuck pieces of the caps in the forks of neighboring bushes, or under projecting ends of bark on the trunks of the pines, the fungus might often escape notice. Such evidence should provoke a search, which will always be rewarded, though the searcher may have to drop upon all fours and scratch like the squirrels before he finds what he is after.

Though what has been said ought almost to be enough to make this autumn *Tricholoma* recognizable, for in the writer's experience, there is no other toadstool, about Boston at least, to which the same remarks would apply, some further note of its characteristics had best be given. As is true of the genus, it has no ring, and its lamellæ, slightly attached to the stem, show the regulation notch or sinus with which anyone who would know *Tricholoma* must become familiar. The lamellæ are broad, white, often with a tinge of yellow at the outer end; the stem is firm, white, or nearly so, sometimes hollow, especially in mature specimens, but frequently nearly solid, or showing merely a looseness of structure in the interior; the cap is smooth and slightly uneven and irregular, often a little shiny, and beautifully streaked with long innate fibrils that extend outward from the centre and deepen the grayish or brownish violaceous tint of the surface. In the older specimens the thin pellicle bearing these fibrils often becomes a little broken up and ragged, and can easily be stripped clean from the white flesh. The fungus has no odor, or scarcely any, though its taste when raw is slightly farinaceous. It is remarkably free from the attacks of insect larvæ, owing in part, no doubt, to the late season of its fruiting. Its size is from two to four inches broad; the stem is at least half an inch thick, and sometimes double that, and two to five inches long.

Like so many of our agarics, *Tricholoma portentosum* is a species of the Old World as well as of the New, having been studied and described by Fries in the early part of this century. As given by the Swedish mycologist, the European habitat of the species is the same as that described for it in New England, where it is, to use Fries's statement, "a common species in pine woods, growing in late autumn in company with *Tricholoma equestre*." The latter is a brownish yellow

toadstool also with a sticky cap, but with yellow gills, rather conspicuous and distinguished looking, as the name implies, which has likewise become favorably known to discerning mycophagists. Notes on it may be found in RHODORA 1: 57.

With the species just mentioned *T. portentosum* is placed in the group *Limacina*, which includes all the members of the genus which have a viscid cap. This characteristic is of great significance in this genus, yet apt to be overlooked by a novice in such matters, partly from inattention, and no doubt, also, because it is not always apparent in dry weather. On this point the warning, uttered by Fries (*Hymenomyces Europæi*, p. 47), is worth repeating: "Those without experience should be careful not to neglect the very natural sub-divisions of this group, or to imagine that the term *pileus viscid*, though the viscosity may disappear in dry weather, is of slight importance; there is no single mark more essential than this, for it depends upon the original structure of the pellicle of the pileus."

To the neglect of this characteristic is probably due the fact that *T. portentosum* is usually confounded with *T. terreum*, though the latter species has a pileus that is always dry. In consequence of this confusion, it is probable that the range of the species is much greater than might be supposed from its recorded distribution. Fries himself, as late as the time of publication of his *Icones*, twenty-five years ago, after he had observed the species for fifty years, expressed his surprise that such a "common and thoroughly distinct species" had escaped the notice of earlier authors.

How widely the species is distributed in the country is not at present known. It has been found in New Hampshire as well as in Massachusetts, and I think also in Maine and in Connecticut. Probably it will be found throughout New England. Yet Mr. Peck, in a recent letter to the writer, says that he has not found it in New York.

In Fries's description [*Icones* 1: 21.] the following points are noted, which are equally true of the fungus as found with us.

"Solitary or gregarious, or even more rarely forming dense clusters, odorless, taste mild. Stem remarkably fleshy-fibrous throughout, subequal, naked, but streaked with fibrils, white. Pileus fleshy, thin in comparison with the stocky stem, at first convex, then plane, somewhat umbonate, unequal and repand, viscid, streaked with dark innate fibrils, but even, glabrous, commonly smoky in color, but varying to violaceous, livid, and in old age becoming pale; margin always naked, thin. Flesh white, slightly inclining to yellowish, fragile. Lamellæ

rounded, almost free, $\frac{1}{4}$ to 1 inch broad, distant, at first white then becoming yellowish or grayish-pallid." Fries's figure [Icones, pl. 24], might have been drawn from New England specimens.

It may be added that the spores are white, narrowly oblong-elliptical, 3 to $3\frac{1}{4}$ μ broad by $4\frac{1}{2}$ to 6 μ long.

Tricholoma terreum Schæff. is a species of the group *Genuina*, characterized by a rough fibrillose or scaly pileus which is never in the least sticky. It commonly shows browner tints than *T. portentosum*, frequently has a strong farinaceous smell, and shows cinereous tints in the lamellæ and on the stem. Placed side by side the two species can easily be told apart by a glance at the pileus, in one case smooth and virgate, in the other rather rough and scurfy. The absence of viscosity in *T. terreum* is, however, the point to which attention must be directed. The spores are white, broadly elliptical, 4 to 5 μ broad by 6 to 7 μ long.

The species is frequent in woods of deciduous trees, but is also found in pine woods. About Boston it is, apparently, not so common as *T. portentosum*, at least it is not so often collected.

ERRATA.

Page 12, line 5; *for* Wissentliche *read* Wissenschaftliche.

" 47, " 3; " var. " forma.

" 80, " 5: " generally " genera.

" 85, " 27; " Nuttal " Nuttall.

" 87, " 1; " ANGUSTIFOLIA " ANGUSTIFOLIA.

" 100, " 38; " De. Ton. " De Ton.

" 109, last line; " 1899 " 1889.

" 164, line 6; " cm. " mm.

" 174, " 38; " Harbor by Mr. C. F. Grover *read* Ossipee by Mr. F. O. Grover.

" 188, last line; *for* 38 *read* 138.

" 190, line 29; *for* from *read* remote from.

" 196, line 24; " charactetistic *read* characteristic.

" 198, lines 13 and 23; *for* *ideaus* *read* *idaeus*.

" 212, last line; *for* Vol. 1 *read* Vol. 2.

" 215, line 36; *for* *Rhyncospora* *read* *Rhynchospora*,

" 220, " 15; " *Daenstedia* " *Dennstaedtia*.

" 225, " 5; " shrubbery " shrubby.

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